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*Ilex serrata*

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## Arboretum Activities

### THE STAFF

On October 1 the Director represented the Arboretum at the dedication of the Climatron at the Missouri Botanical Gardens in St. Louis. On October 4 he spoke to the Comstock Society on "Fall Color at the Arboretum" and on October 11 he gave an illustrated lecture entitled "A Botanist in India" to the Natural History Society of Delaware in Wilmington.

Dr. Li was one of the principal speakers at the Pennsylvania Garden Symposium on October 13. The subject of his address was "Japanese Gardens and Bonsai and their application to the American Home." On December 5 he spoke on

"Plants of the Bible" at the meeting of the Germantown Horticultural Society.

Dr. Allison participated in a program of in-service meetings for high school science teachers held at Radnor High School on October 10 and at Kennet Square High School on October 11. On each of these occasions she gave a two-hour lecture demonstration on an important area of biology. On December 8, Dr. Allison spoke to the Gloucester County Nature Club at Wenonah, New Jersey, on the topic, "Dividends from the Fungal World."

*(Continued on Page 70)*

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## The Deciduous Hollies

JOHN M. FOGG, JR.

To many persons the word "holly" conveys the impression of a plant with thick, spiny evergreen leaves and bright red berries. Our well known American Holly, *Ilex opaca* Ait., and the almost equally familiar English Holly, *I. Aquifolium* L., both fit this definition, as do a few other species, such as *I. cornuta* Lindl. and *I. Pernyi* Franch. To some, however, it comes as a shock to learn that our common Inkberry, *I. glabra* (L.) Gray, is also a holly, although its leaves are without spines and its berries are black rather than red. The same is true of the Japanese *I. crenata* Thunb. and a number of other species.

In all of the forgoing hollies the leaves are leathery and persistent throughout the year. There is, however, within the genus *Ilex* a group of species which are even less "holly-like" than Inkberry. Their leaves are membranaceous, rather than thick or coriaceous, and they lose their foliage with the coming of winter. Nevertheless, by the structure of their flowers and their fruit these, too, deserve to be considered hollies, although the common names which they bear usually obscure this fact.

It is entirely appropriate that the evergreen hollies should over the years have claimed the major share of attention on the part of growers. However, the deciduous forms are well worthy of a place in any collection of ornamental shrubs, and it is the purpose of this account to emphasize the merits of some eight or nine species



Fig. 43 *Ilex serrata*, male flowers



Fig. 44 *Ilex serrata*, female flowers

which are either in cultivation at the Morris Arboretum or are known to be hardy in the Middle Atlantic States. The following species belong in this category: *I. verticillata* (L.) Gray; *I. laevigata* (Pursh) Gray; *I. geniculata* Maxim; *I. serrata* Thunb.; *I. Amelanchier* M.A. Curtis; *I. longipes* Chapm.; *I. collina* Alexander; *I. decidua* Walt.; and *I. montana* T & G.

### RANGE OF VARIATION

The deciduous hollies vary in size from the low-branching shrubby aspect of *I. Amelanchier* to the tree-like habit of *I. decidua* and *I. montana*.

The foliage of most of them is membranaceous and somewhat veiny, although the leaves of *I. decidua* are dark green, lustrous and rather thick.

As is the case in all species of hollies, the small white or cream-colored flowers are almost always unisexual, and a single plant bears only one kind of flowers. This means that an individual specimen is either male (staminate) or female (carpellate), a condition which is called dioecious.

The male flower bears functional stamens surrounding a shrunken or abortive ovary (Fig. 43),<sup>1</sup> whereas in the female flower the ovary is well developed and the stamens are small and function-less (Fig. 44).

<sup>1</sup> Illustrations by Drs. Patricia Allison and H. L. Li.

There is, apparently, no known method of determining the sex of any species of *Ilex* until it blooms, but fortunately the carpellate flowers of many species are receptive to pollen from the male flowers of the same or other species. For example, all of the specimens of *I. verticillata* growing at the Morris Arboretum appear to have female or carpellate flowers and yet there are enough male plants of other species of *Ilex* in their proximity to insure an abundant supply of brilliantly colored fruit each autumn.

The so-called berries of hollies are, more properly, berry-like drupes with several nutlets. Those of the deciduous species are often extremely showy; they vary in color from red or scarlet to yellow or white and in size from a diameter of less than a quarter of an inch (4-5 mm.) in *I. serrata* to about three-eights (1 cm.) in *I. montana*. Few shrubs or small trees are more attractive in the fall than a fully-fruited specimen of Black Alder (*I. verticillata*) or Possum Haw (*I. decidua*).

#### GEOGRAPHICAL DISTRIBUTION

As is true of a great many groups of woody plants, the genus *Ilex* has its main centers of distribution in the eastern United States and southeastern Asia. (Fogg 1942). It is true that the so-called English Holly (*I. Aquifolium*) is native to the British Isles, western and southern Europe, northern Africa and central Asia and that the Azores Holly (*I. Perado* Ait.) occurs in southern Spain, the Azores, Madeira and the Canary Islands. However, most of the remaining representatives are indigenous either to eastern temperate North America or to Southeastern Asia including the Japanese archipelago and certain subtropical areas to the south.

With respect to the deciduous hollies here under consideration, the above geographic affinities are well illustrated: *I. geniculata* and *I. serrata*, both natives of Japan, are closely related to our eastern American *I. verticillata* and *I. laevigata*. *I. macropoda* Miq., which is often considered to be merely a smaller fruited variety of the American Mountain Holly (*I. montana*), is indigenous to Japan, while the closely related *I. macrocarpa* Oliv., which is apparently not hardy in our area, is a native of central China.

#### CLASSIFICATION

The deciduous hollies belong to the subgenus PRINOS, which is characterized by having its flowers either solitary in the axils of the leaves or fascicled with the leaves on short truncated lateral branchlets. This subgenus is further divided into two sections: Euprinus and Prinoides.

In the section Euprinus the flowers are borne



Fig. 45 *Ilex verticillata*

in the axils of the leaves and the nutlets of the fruits are smooth on the back. Here belong: *I. verticillata*, *I. laevigata*, *I. geniculata* and *I. serrata*.

In the section Prinoides the leaves as well as the flowers are usually fascicled on short lateral spurs and the nutlets are ribbed or striate on the back. Also, the fruits are generally larger than in the preceding group. To this section belong: *I. Amelanchier*, *I. longipes*, *I. collina*, *I. decidua* and *I. montana*.

#### SECTION EUPRINUS

*Ilex verticillata* (L.) Gray. Black Alder, Winterberry. A shrub seldom more than 10 feet (3 m.) tall which occurs in swamps, woods and thickets from the Gulf of St. Lawrence west to Minnesota and south to Florida and Louisiana. The leaves of this species are elliptic or obovate, single or doubly serrate on the margin, and pubescent on the lower surface. The flowers are short-stalked and the bright red fruits are borne in tight clusters. The species is undoubtedly one of the most spectacular of our brilliantly fruited native shrubs in the fall of the year (Fig. 45).

Although in no way related to the alders this plant doubtless owes one of its common names, Black Alder, to the fact that its leaves often turn brown or blackish after the first frost. Another common name Winterberry may seem to be a misnomer in areas where the birds rob the shrubs of their fruit long before the coming of frost.

At the Arboretum we have several fine specimens of this species in the Langstroth Bee Garden, in the old holly planting on the south slope and near the Swan Pond. Recently we have established a special grouping of deciduous hollies on the slope below the Gates Building and have selected four plants of *I. verticillata* as the basic element against which to display the other members of this series.

Several varieties of *I. verticillata* have been described, but the only one which seems worthy of recording for horticultural purposes is *forma chrysocarpa* Robins, in which the drupes are yellow rather than red.

*Ilex laevigata* (Pursh) Gray. Smooth Winterberry. This species is closely allied to the preceding in habit, mode of growth and the character of its foliage. However, the leaves are less pubescent beneath, the staminate flowers are borne on long, slender pedicels, and the drupes tend to be orange-red or scarlet instead of reddish. According to Wyman (1956) this species is capable of setting fruit without pollination. No doubt this faculty, which is known as parthenocarpy, is possessed by other species as well.

Smooth Winterberry is a handsome shrub in our coastal plain swamps and wet thickets from Maine to northern Georgia. It succeeds well in ordinary garden soils of a somewhat acid nature and is richly deserving of a place in any shrub collection. A form with yellow fruit has been described.

*Ilex geniculata* Maxim. First introduced into this country in 1894 by Dr. C. S. Sargent, Director of the Arnold Arboretum, who collected the seeds in Japan. This species bears a strong resemblance to the two preceding ones, but differs in its longer more acuminate leaves and in the much longer and more slender fruit-stalks (peduncles). The latter may bear one to three drupes and are several times as long as the petioles. The fruits are bright red. Several young plants of this species were moved into our deciduous holly collection two years ago and may be expected to produce berries in another year or two.

*Ilex serrata* Thunb. Finetooth Holly. Also a native of Japan, this species develops into a well-shaped shrub usually about 6 to 7 feet (approximately 2 m.) tall. The leaves which are dull green above are sharply serrulate on the margins

and densely pubescent on the lower surfaces (Figs. 43 and 44).

Although the corollas of most species of *Ilex* are white or creamy, those of *I. serrata*, especially the staminate ones, are delicately flushed with lavender.

Few hollies are more fully fruited than this one; Figure 46 portrays a branch of this species photographed in the Arboretum on September 23. The drupes, although small, are of a rich deep reddish color. Unfortunately for humans, the fruit is also attractive to birds and a full-grown shrub may be completely divested of its crop of berries within three or four days after they mature. Both white and yellow fruited forms have been described in this species.

#### SECTION PRINOIDES

*Ilex Amelanchier* M.A. Curtis (*I. dubia* (G. Don) B.S.P.) A shrub or small tree which occurs sparingly in swampy woods from southeastern Virginia to Georgia and Louisiana. The blunt, oblong leathery leaves must have suggested the foliage of the Shadblush (*Amelanchier*) to



Fig. 46 *Ilex serrata*



Fig. 47 *Ilex decidua*, fruiting branch

the author. The large scarlet drupes are borne on long, thread-like pedicels.

Although this species is not in cultivation at the Morris Arboretum, it has been successfully grown only a few miles from here by Mrs. J. Norman Henry at Gladwyne, Pa.

*Ilex longipes* Chapm. Georgia Holly. This relatively little known Holly is found in a variety of habitats from West Virginia and Tennessee to Florida and Louisiana. It is a large shrub with thin elliptic to lanceolate leaves which are remotely serrate on the margin, smooth above and hairy on the midrib beneath.

Both types of flowers are unusually long-pedicled (giving the plant its specific name); the female somewhat more so than the male. The large globose fruits are red or, in the plant which has been called *forma Vantrampi* M. Brooks, yellow. This will be further discussed under the following species.

Our single specimen of *I. longipes* at the Morris Arboretum is a gracefully branching shrub about 13 feet (4 m.) tall and almost as wide. Since it is a male plant it is impossible to report on the characteristics of its fruit.

*Ilex collina* Alexander. In describing this species from West Virginia, Alexander (1941) characterized it as a small tree 3-4 m. tall with thin, glabrous, broadly elliptic to obovate leaves, their margins finely serrate with teeth abruptly ending in large blads. The bright red drupes were said to be 7-8 mm. in diameter and borne on pedicels 10-15 mm. in length. According to the author, this species is related to *I. longipes* from which it differs in its more strongly ridged nutlets and to *I. monticola* (*montana*) in the longer pedicels of its fruits.

Woods (1951), in reviewing the status of *I. collina*, had this to say, "In 1936, A. B. Brooks reported the discovery of *Ilex longipes* Walt. in

West Virginia. Several years later, Maurice Brooks (1940) reported the discovery of a yellow fruited form of this species and subsequently named it *forma Van Trampi*. In 1941, E. J. Alexander, who had been studying plants of the same species but from a different locality for a number of years, named the species *I. collina*. Following this [in 1944] Core and Davis transferred the yellow fruited form to this species. In the eighth edition of Gray's Manual of Botany (1950), Fernald regarded the long-pedicled holly of Virginia and West Virginia as being identical with *I. longipes*. There are several reasons why the latter is not a satisfactory treatment, and the writer suggests that Alexander's name be used.

"As Alexander has shown, there are differences between *I. longipes* and *I. collina* in the marginal spines and lower leaf surface and in the sepals. Because of the limited number of specimens at his disposal for study, he failed to see the range of variation in the striation of the nutlets. The writer, who has been able to study a larger number from a wider geographical range, finds that the nutlets may be much more smooth than stated in the original description of the species (Alexander 1941).

"The affinities of this species lie with *I. verticillata* rather than with *I. montana*, as thought by Alexander. The deeply impressed venation approaches that of *I. verticillata* rather than *I. montana*. This is also true of the thickness and number of marginal teeth of the leaf blades and the shape of the calyx lobes."

It appears that considerable confusion still exists concerning the status of *I. collina*. Dr. A. J. Sharp, Professor of Botany at the University of Tennessee, who knows this plant in the field, tells me that he is unable to separate it from *I. longipes*. Unfortunately, due to repairs now in progress at the New York Botanical Garden,



Fig. 48 *Ilex decidua*, close-up of fruit

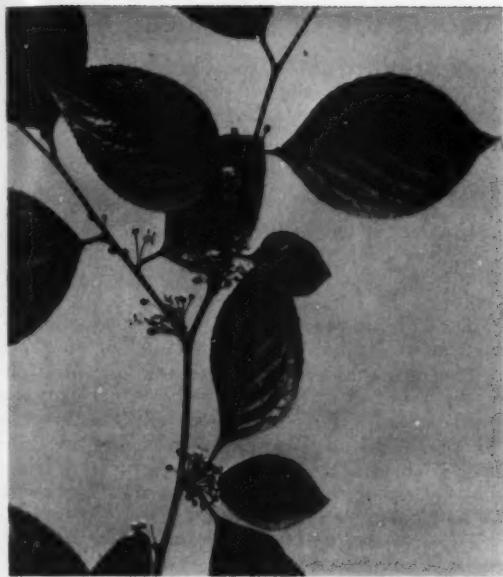


Fig. 49 *Ilex montana*

it has been impossible to examine the type of this species which is in the herbarium there. Further discussion of this problem will therefore have to be deferred. In the meantime, we are maintaining Alexander's species since it is in cultivation under this name. Thanks to the generosity of Mr. Henry Hohman, of Kingsville Nursery, Maryland, we have recently received a fine female specimen of this species. Its performance will be followed here with keen interest.

*Ilex decidua* Walt. Possum Haw. In some ways this is the most showy of all of the deciduous hollies. It is a tall shrub or small tree up to 30 feet or more (10 m.) which inhabits thickets, low woods and bottomlands from Maryland to Florida and Texas. The oblong-cuneate, crenately-margined leaves are dark green and lustrous above, somewhat pale and slightly pubescent beneath. The globose drupes, which are 7-8 mm. in diameter, are orange or scarlet and are usually borne in such profusion as to create the illusion of dense verticels (Figs. 47 and 48).

When not denuded by voracious birds this species is said to retain its fruit well throughout the winter. Here at the Arboretum, however, the berries are seldom allowed to persist after the middle of October.

*Ilex montana* T. & G. (*I. monticola* Gray) Mountain Holly, Mountain Winterberry, Large-leaf Holly. This is a tall shrub or small tree which may attain a height of 35 to 40 feet (12 m.). It is a denizen of rich wooded slopes and uplands from New York to Georgia and Alabama. The large membranaceous leaves of this species are sharply serrate on the margins, usually glossy above and either smooth or pubescent beneath. (Fig. 49) The staminate flowers are on rather long (1-2 cm.) stalks or pedicels, while those of the carpellate ones are distinctly shorter. The fruits, which are about three-eighths of an inch (1 cm.) in diameter are orange-red or scarlet and against the background of the large lustrous leaves they produce a fine effect in early autumn. The nutlets are conspicuously striate on the back.

Mountain Holly is a polymorphic species and a number of varieties have been recognized; of these the most wide-spread in our area is var. *mollis* (Gray) Britt., in which the lower surfaces of the leaves are soft-pubescent, at least along the nerves.

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# History of the American Association of Botanical Gardens and Arboreta

JOHN C. WISTER

The AABGA owes its organization largely to the enterprise and energy of one man, Mr. Robert Pyle of West Grove, Pa. For some twenty years, beginning in the early 1920's, Mr. Pyle had been chairman of the committee on botanical gardens and arboreta of the American Association of Nurserymen, and in that capacity had been largely responsible for the preliminary work which resulted in the establishment of the National Arboretum in Washington.

Mr. Pyle was an indefatigable traveler and attender of meetings. In the course of some twenty years he visited every part of this country to attend meetings of various nursery and florist organizations and at the same time made himself familiar with the botanical gardens or arboreta in each area. His almost yearly trips to Europe to get new roses gave him an opportunity to visit most of the famous botanical gardens in England, Scotland, Ireland, France, Belgium, Holland, Italy and Spain.

It is quite evident therefore, that he had a background of information possessed by no other individual in our generation. While he was actively promoting the idea that he then called "United Horticulture", and which has now resulted in the formation of the American Horticultural Council, now merged with the American Horticultural Society, he saw the need of bringing the various arboreta and botanical gardens in closer touch with each other. Quite naturally he spoke about this to many officials in these institutions and finally in 1940 arranged for a meeting in Cleveland.

There is apparently no exact record of the first individuals with whom he worked in this effort, but it is quite evident that Donald Wyman and Henry Teuscher were two of the leading people on whom he relied. They met with him before the organization meeting, and the group also included Nelson M. Wells of the Cornell University Arboretum, Dr. Harold A. Senn, Dominion Arboretum and Botanical Garden and Department of Agriculture, Ottawa, Canada, and G. D. Cooper of the Holden Arboretum, Cleveland, Ohio.

A report of this meeting supplied by Dr. Henry T. Skinner states that Dr. Wyman acted as chairman, having been appointed in 1939 by the American Institute of Park Executives. He reported that 155 letters had been mailed to

institutions listed in the directory of the American Association of Nurserymen and that 45 replies had been received. About half had promised to attend the meeting and the other half, while unable to attend, had expressed willingness to support the project.

The terms under which the new organization might join as a chapter of the American Institute of Park Executives were explained, with the privileges and duties appertaining to this. It was urged that the National Arboretum should become the coordinator of all arboreta in the country.

This committee unanimously agreed that there should be an organization and that the membership should be based on individuals and not on institutions. Until the new organization could develop strength to stand alone, it was considered best to affiliate with the American Institute of Park Executives, although affiliation with the American Association for the Advancement of Science and the American Association of Nurserymen was seriously considered. Proposed By-Laws were presented which were based on those of the American Association of Zoological Parks and Aquariums which had already become affiliated with the American Institute of Park Executives.

The organization meeting of the AABGA was held in the Hotel Statler, Cleveland, on September 25, 1940, with Dr. Wyman presiding and Mr. Pyle acting as temporary secretary. A breakfast meeting was attended by nearly 40 people who approved and signed the revised By-Laws as drafted the evening before.

Mr. Pyle outlined briefly the history of the growth of the arboretum idea in America. He stated that the study of his committee of the American Association of Nurserymen had led to the conviction that the various institutions had developed in too isolated a manner. Many problems had made it evident that cooperation would be advantageous, particularly for assistance in developing new arboreta in those regions which needed them and which at present did not have them. Nelson Wells, the second speaker, outlined many possible activities for the new association. Henry Skinner spoke about the advantages of having certain institutions specialize along certain lines as on certain plants. He also suggested that the various arboreta

should supply complete lists of the plants which they grew.

John C. Wister spoke of the difficulties of getting desirable new ornamental plants into commerce and described the methods that had been carried on for many years with fruits by the New York Fruit Testing Association.

Mr. Pyle followed this with remarks concerning the different types of nurseries best fitted for undertaking the introduction of such new material and said that he felt that the Nursery Association as well as the U.S. Department of Agriculture could deal more practically with our new association than with individual arborists.

Samuel Baxter, Superintendent of Fairmount Park, Philadelphia, related the experience of Mr. A. E. Wohlert in bringing about the introduction of the Japanese Cherries into commercial nurseries in this country.

Following the breakfast session additional persons joined the meeting and at that time Dr. E. D. Merrill, Director of the Arnold Arboretum, spoke on the great development of horticulture which had been aided by the introduction of new plants by the Arnold Arboretum, and particularly about the introductions of Professor C. S. Sargent and Dr. E. H. Wilson. He mentioned the great difficulties with plant exportation due to troubled world conditions.

Dr. C. Stuart Gager, Director of the Brooklyn Botanic Garden, spoke on "Popular and Scientific Horticulture in a Botanic Garden." He mentioned compiling a book on arboretums and botanical gardens of the world, about 550 in all, of which 122 had been in the United States; 102 of these were in existence in 1940; 17 inaugurated before 1900 had been discontinued and 3 inaugurated since 1900 had been discontinued. He felt that before 1900 there were very few institutions in this country really deserving of the name arboretum or botanical garden, and gave definitions, distinctions and statistics about these. He also mentioned the garden instruction of school children at the Brooklyn Botanic Garden.

At the formal organization meeting which then followed, Dr. Wyman was made chairman and Mr. Pyle secretary, and a committee was set up consisting of Dr. Wyman, Henry Teuscher, Nelson M. Wells, Harold A. Senn, H. T. Skinner, C. E. Godshalk, G. D. Cooper, and Robert Pyle, to work out the preliminary plans. The following officers were elected by this group: Dr. Donald Wyman, Chairman, Dr. Henry T. Skinner, Vice-Chairman, Dr. C. E. Godshalk, Secretary, and two directors, Dr. C. Stuart Gager and Henry Teuscher.

The notes of this meeting do not speak of other directors or of the term of office of direc-

tors, but it is believed that Mr. Stanley M. Rowe of Cincinnati was quite soon added to the list of directors.

These officers carried on the activities of the organization for the next six or seven years, but owing to the war very few meetings were held.

The new organization had very hard sledding in the beginning. This is easily understood because some fifty or sixty members scattered across the country could not get together often for meetings. Indeed, it was not even practical to hold many executive committee meetings, and most of the work was done by correspondence. Here the greatest credit is due to the first chairman and the first secretary, who carried so much of the burden.

In addition to the difficulties of distance there had been differences of opinion as to the best way to carry on an organization of this character. Those who organized the Association felt it wise to put it under the temporary wing of the American Institute of Park Executives and several of the AABGA annual meetings were held in connection with the meetings of this great organization. While this gave members an opportunity to meet many of the park executives of the country, our little organization was completely lost in meetings of many hundreds of people, with three and four day programs of all-day sessions allowing no time for our own small group. The great expense of meeting with the big organization was also a handicap and members complained of paying the \$20.00 registration fee for which they got nothing. Therefore, after several inconclusive polls of the membership, the officers and executive committee in 1950 decided to sever the connection with the Institute and go it alone.

During the period of affiliation, the magazine "Parks and Recreation" published most complete notes concerning both the AABGA activities and those of its member institutions. The Newsletter inaugurated in 1950 has been a very small substitute for this splendid publication, but it is perhaps more suited to our needs and will, it is expected, grow with the organization.

The membership list today contains 164 names, most of them representatives of botanical gardens, arboretums and parks. Included among our members, also, are landscape architects, nurserymen, botanists, and amateurs who are actively interested in the objectives of the organization.

The Association has sponsored the following publications:

Lilacs for America. Edited by John C. Wister. 1942; revised 1943 and 1953.

Crab apples for America. Edited by Donald Wyman. 1943; revised 1955.

**Maples cultivated in the United States and Canada. B. O. Mulligan. 1958.**

Since 1951 Mr. Carl W. Fenninger, President of the John J. Tyler Arboretum, has been Secretary-Treasurer of the organization. It is largely due to his untiring energy and loyal devotion that the AABGA has made such tremendous strides during the last decade.

In spite of early discouragements, those who helped found the organization and who have stuck to it through the years, feel that it has

already performed an important function in the lives of the institutions which it represents and that it has unlimited opportunities for usefulness in the future. Many of its members, indeed, feel that if it had done nothing else than to get the representatives of the different institutions together so that they might know each other, the whole effort would have been worth while. We firmly believe that the AABGA has an important future if its members will continue to support the work which is so much needed.

## **Associates' Corner**

### **A DEDICATED MAN**

John Tonkin was born in Penzance, Cornwall, England on October 24, 1887. A true Cornishman. Before coming to the United States he took the precaution of marrying Margaret Williams on May 10th, 1913 and they arrived in this country May 26th, 1913.

After a short interval with the Newbold family, Mr. Tonkin came to Miss Morris on July 14th, 1913. He has watched "Compton" develop from a handsome private estate into the lovely and valuable Arboretum of today. Many of the trees and shrubs are like his own children. He attended their birth and glories in their stalwart attainments.

When the news that the City of Philadelphia was going to run a sewer pipe line through the Arboretum, great was the woe among its many lovers. Not so John Tonkin. In true Cornish fashion he did not waste effort trying to buck the inevitable, but turned all his energies into making the best of a grim situation.

First he diplomatically set about cultivating the friendship and cooperation of all the foremen and superintendents who would be connected with the job, gained the confidence of the workmen and sold them on the value and beauty of the plant material they would have to disturb. He succeeded so well that there has been very little destruction and the restoration has proceeded in a very satisfactory and amicable fashion.

When the construction (or destruction) actually entered the Arboretum gates, at the end of June 1960, Mr. Tonkin practically slept on the

bulldozers. Even when he did go to bed in the Gate House he and Mrs. Tonkin occupy on Hillcrest Avenue, I am sure he kept an eye open and ear acock for the slightest movement of man or machine. He was constantly everywhere, watching over each limb and twig. All with a smile and pleasant word, no matter how weary he was. Through heat, rain, mud, Donnas and unexpected situations, Mr. Tonkin and the City workmen have cooperated and remained on the best of terms. A triumph for both sides and a happy situation for the Arboretum. It was not always an easy matter; John Tonkin has many other responsibilities besides constantly curbing bulldozers. He is the Superintendent of the entire Arboretum, has a daughter, Mrs. Lewis A. Medlar who lives in Oreland, and two grandchildren.

John Tonkin was a vestryman of St. Thomas's Episcopal Church for 15 years and is intensely interested in the care and cultivation of their grounds. He is also a member of the Germantown Horticultural Society and the National Association of Gardeners. Mr. Tonkin's interests are not all local, he has given a great deal of his time and effort to establishing the International Peace Garden in Montana.

We of the Arboretum are indeed thankful to have such a dedicated, able, and courteous man in charge of our beloved place. May he be with us for many years to come.

**Marion W. Rivinus**

# Performance of Five Selected Black Locust Clones at the Morris Arboretum

FRANK S. SANTAMOUR, JR.<sup>1</sup>

The wood of the black locust (*Robinia Pseudoacacia* L.) has long been prized for special uses. Some of these uses, as well as an account of the early cultivation of this species, have recently been discussed in the Morris Arboretum Bulletin by Li (1959). Although of local importance for some time, it was not until the late 1930's that national attention was focused on black locust. At this time the Soil Conservation Service of the U. S. Department of Agriculture undertook large-scale studies on the use of this species in erosion control. In 1950, the Morris Arboretum acquired material of five of their selected clones, including the Shipmast locust, for test planting on the Farm area. As a background to the discussion of the performance of these trees, it would be appropriate to examine some of the reasons for increased interest in this species.

## VARIATION IN BLACK LOCUST

Perhaps the greatest impetus to the intensive study of black locust was the recognition of a particular type of straight, fast-growing, and decay-resistant locust on Long Island, N. Y. Hopp (1941 a) described three major form-types as (1) Pinnate — with a well-defined stem and major branches on the lower portion of the crown, (2) Spreading — with a well-defined stem and major branches in the upper part of the crown, and (3) Palmate — with no easily traced main stem. He advocated the use of the pinnate type, such as the superior trees on Long Island, for farm planting.

An early report of variation in black locust on Long Island had been made by Hicks (1883). He referred to the "white" locust as being of the poorly-formed type usually found throughout its range and the "yellow" locust as a type with an exceptionally straight trunk and other desirable qualities. Long Island is outside the natural range of black locust and, therefore, both types of locust must have been introduced. The best evidence regarding the introduction of the "yellow" type, as summarized by Detwiler (1937) is that it was brought to Long Island from the lower Chesapeake Bay region of Virginia by a Capt. John Sands about the year 1700. However,

extensive searches made in this area subsequently have failed to locate the original source.

## THE SHIPMAST LOCUST

According to Detwiler (1937) the name "shipmast" to denote this superior or "yellow" form was suggested by Dr. Charles F. Swingle in 1934 because of its tall, straight trunk. Raber (1936) used this common name when he described the select type as *R. Pseudoacacia* var. *rectissima*. Raber (1936) and Hopp (1941 b) have discussed the characteristics of form, bark, flowers, leaflets, and stipular spines which distinguish the Shipmast locust from the common type. In addition, they point out that almost complete sterility is characteristic of the Shipmast locust.

The high degree of sterility led to the early widespread practice of propagating these superior trees on Long Island by the digging and replanting of root sprouts. Swingle (1937) found that black locust was easily propagated from root cuttings and this method was used in the work of the Soil Conservation Service. The result of such early and extensive clonal propagation would normally result in the wide distribution of a single genotype. Hopp (1941 b) believed that probably all the Shipmast locust on Long Island, with the exception of one stand, were of a single clone. He also stated that many individual trees throughout the Northeast have Shipmast characteristics and Cope (1938) reported locust of the Shipmast type as quite common in the Hudson Valley. Thus, present evidence would suggest that the type of locust now cultivated as Shipmast is probably a mixture of several clones. As such, its designation as a botanical variety is not correct and the type should be called a cultivar and designated as *R. Pseudoacacia* 'Rectissima', as in Li (1959), or *R. Pseudoacacia* 'Shipmast'.

## INSECT AND DISEASE RESISTANCE

One of the major impediments to successful black locust culture is the locust borer (*Megacyllene robiniae*). The mining activities of the larvae in the heartwood cause extensive damage and the trees frequently break off at a point of serious injury. Hall (1937) compared borer damage to Shipmast locust on Long Island and common locust in Ohio by means of actual counts of emergence holes. The Shipmast locust

<sup>1</sup> Dr. Santamour is a geneticist on the staff of the Northeastern Forest Experiment Station, U. S. Forest Service. He is stationed at the Morris Arboretum of the University of Pennsylvania, where the Experiment Station and the Arboretum cooperate in genetics research.

appeared to be more resistant, although the climatic conditions of the two sites were different and the possibility of racial differences in the borer populations was not considered. In general, trees of high vigor are least attacked by the borer. Hall also pointed out that the greater apparent borer damage to common locust may be due to the fact that crooked trees are more susceptible to wind breakage after attack than the straight-trunked Shipmast. Berry (1945) reported, on the basis of relatively few trees, that Shipmast locust was attacked as readily as common locust in North Carolina plantings. Wollerman<sup>1</sup> stated that borer injury was greater on Shipmast locust than on other selected clones in Ohio and Maryland plantations.

Hirt (1938) found evidence that confirmed the old idea that posts of Shipmast locust were more durable in service. The wood of Shipmast locust was much more resistant than common locust to decay by four decay fungi under controlled conditions. However, only one tree of each type was tested. Grant *et al* (1942) stated that systemic brooming, a virus disease, had not been found naturally on Shipmast locust but had been transmitted to it by grafting.

TABLE 1. — Source data on the black locust clones under test at the Morris Arboretum

S.C.S. Number	Morris Arboretum No.	Locality of Origin
H.C. 4022	50-307	Glen Cove, Long Island, N. Y.
H.C. 4138	50-308	Blackwood, Va.
H.C. 4146	50-309	Barton, W. Va.
H.C. 4148	50-310	Barton, W. Va.
H.C. 4149	50-311	Townsend's Draught, W. Va.

#### THE ARBORETUM PLANTING

Data on the origins of the five selected clones received in 1950 from the Soil Conservation Service Nursery at Beltsville, Maryland, are given in Table 1. Clone H. C. 4022 is the Shipmast locust and the other clones are described as having pinnate growth form. All trees were 1-year-old from root cuttings when received.

The trees were set out in non-contiguous square plots of 25 trees (5 x 5) and the spacing between trees and rows was 8 feet. The maximum distance between neighboring plots is 70 feet and the total area of Block I (near the corner of Northwestern and Stenton Avenues) amounts to about one-fourth of an acre. Sufficient trees of H. C. 4022 and H. C. 4148 were received to plant these clones in Block II. This area is near the northern boundary of the Arbo-



Fig. 50 Shipmast Locust (clone H. C. 4022)

return on Stenton Avenue and about 0.2 miles from Block I. The soil throughout the planting area is circumneutral and is an excellent site for black locust.

#### MEASUREMENTS AND RESULTS

Various measurements were made on these trees in the fall of 1960. Diameter at breast height (4.5 feet above the ground) was measured with a steel diameter tape to the nearest tenth of an inch. On trees forked below 4.5 feet, only the largest stem was measured. Height measurements to the nearest half-foot were made with the "Spiegel-Relaskop". The number of locust borer emergence holes were counted on the lower 4.5 feet of the trunk. These data are presented in Table 2.

Most of the mortality appeared early in the life of the plantation and may have been caused by the poor condition of the stock. Since borers seldom attack smooth-barked young trees, they were not the major factor. Only six trees, now dead and standing, in the entire planting probably owe their demise, in part, to the locust borer.

Data on height and diameter were subjected to statistical analysis by the "t" test. There were no statistically significant differences in either height or diameter of clones H. C. 4022 or H. C. 4148 in the two blocks. For this reason and the fact that the remaining three clones are not now represented in Block II, comparisons between clones were made only on the growth in Block I. The Shipmast locust (H. C. 4022) was the poorest in growth rate, and the differences between this clone and all the others were highly significant. Wollerman (1956) also reported that clone H. C. 4022 was among the poorest in

<sup>1</sup> In the discussion following Wollerman (1956). Proc. Third Northeastern Forest Tree Improvement Conference, 1955, p. 37.

TABLE 2.—Characteristics of 5 black locust clones at 12 years from root cuttings

Clone	Block I					Block II				
	No. trees living	Ave. height	Ave. diameter	No. trees attacked by borer	Ave. no. borer holes per tree	No. trees living	Ave. height	Ave. diameter	No. trees attacked by borer	Ave. no. borer holes per tree
H.C.4022	24	24.9	3.7	11	8	11	24.1	4.2	7	3
H.C.4138	24	31.8	4.4	7	3	...	...	...	...	...
H.C.4146	20	33.1	5.5	3	6	...	...	...	...	...
H.C.4148	15	31.0	5.1	1	18	21	33.9	5.4	3	3
H.C.4149	12	36.9	5.9	1	3	...	...	...	...	...

growth rate of the 10 clones he studied in Ohio and Maryland. Shipmast locust was about equal to the best local source in Southern Illinois (Minckler, 1948). Clone H. C. 4149 was significantly taller than all the other clones. The diameters of clones H. C. 4149 and H. C. 4146 compared to that of H. C. 4138 showed highly significant differences.

The Shipmast locust also appeared to be more susceptible to damage by the locust borer, both with regard to the number of trees attacked and the severity of the infestation. Several trees of this clone are just barely alive. One tree of clone H. C. 4148 in Block I has been heavily attacked but the tree had lost its top about four years ago and may have been rendered more susceptible.

Tree form and habit are characteristics that are difficult to evaluate, especially on young trees. On the basis of visual examination and comparisons of trunk straightness, the Shipmast locust must be regarded as inferior to the other clones. Observations made on the nine trees of each plot that do not occur in a border row also indicate that Shipmast locust does not prune itself well and live branches persist for a long

time on the lower portion of the bole. Some idea of the difference in form may be obtained from a comparison of Figures 50 and 51.

#### DISCUSSION

In the black locust clonal test at the Morris Arboretum, the Shipmast locust (H.C. 4022) has not lived up to expectations but it is not hard to understand why this tree had been judged superior at one time. In the first place, early comparisons were made between this cultivar and run-of-the-woods black locust which is generally a poor-quality tree. In a natural stand it may sometimes be difficult to see the individual good trees because of the forest of poor trees. Fortunately, this task is not impossible. The selection of superior phenotypes from natural stands today forms one of the major foundations of forest-tree improvement work. The four other locust clones in the Arboretum planting, as well as numerous others selected by the Soil Conservation Service, are a demonstration of the fact that better trees are available, can be found, and can be put to use to increase the quantity and quality of America's timber supply.

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Fig. 51 Clone H. C. 4138

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## Arboretum Activities

(Continued from Page 58)

Miss Milton has recently returned from a nine weeks' trip to Europe and the Middle East. She visited many of the important gardens of England, Holland, France and Italy and spent several weeks in Turkey and Israel. As a result of the numerous fine contacts made by Miss Milton, publications, plants and seeds will be acquired by the Arboretum. This is especially true of Turkey from which during recent years we have had little or no material.

### OPEN HOUSE

For the first time since its inception several years ago our annual Open House was held in the autumn instead of the Spring. Sunday, October 16 was the date and some 300 associates and their friends visited the Arboretum, partook of refreshments and wandered about the grounds enjoying an unusually fine display of fall color.

This year, in place of a series of guided trips, we arranged a tour for our visitors to follow at their own pace. A trail, clearly designated by arrows and signs took in such features as the Studio, (where two courses for our associates were given this autumn), Oak Row (with its fine collection of ivies), the Ericaceae planting (a recently established concentration of members of the Heath Family), the Franklin Tree (on which a few belated flowers were still to be seen), the Medicinal Garden (in its new and permanent location), and the ever-popular Rose Garden. At each station a member of the staff was in attendance to welcome visitors and answer questions. This procedure elicited such favorable comment from our visitors that we shall doubtless repeat it on future occasions.

### CONTRIBUTOR'S FUND

Several years ago there was established a Contributor's Fund to be used at the discretion of the Director. Donations are, of course, tax ex-

empt and anyone who contributes to this Fund will have the satisfaction of knowing that his gift will help to make possible some special project which could not otherwise be accomplished.

### FALL PLANTING

Reference has frequently been made in these notes to the fact that autumn is our busiest season for moving plants from our nurseries to their permanent positions on the grounds. Favorable by ideal weather throughout November and early December, this fall has been an unusually active one and nearly 200 specimens have been transplanted. About half this number were taken out of the greenhouse nursery, which will now be completely renovated.

One of our main projects has been to increase the representation in our Pinetum which occupies the hilltop between the Gates Building and the Morris Mansion. Among the pines which have been placed in that area this autumn are *Pinus apachea*, *P. arizonica*, *P. Armandi*, *P. Jeffreyi* and *P. leiophylla* var. *chihuahuana*.

Considerable progress has also been made in adding to the family groupings on the area north of Northwestern Avenue.

### COST OF BULLETIN

Despite increased costs in printing and mailing, we have heretofore steadfastly resisted the temptation to raise the cost of this publication. The time has finally arrived, however, when we can no longer be so unrealistic. Beginning with Volume 12 for 1961 individual copies of the Bulletin will cost 40 cents (instead of 30 cents) and the price of a year's subscription will be raised from \$1.00 to \$1.50.

The Bulletin will, of course, continue to be sent free of charge to all of our Associates.

J.M.F., Jr.

## Library Accessions

Among the items which have been added to the Library during 1960 are the following:

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## New Associates

The Arboretum is happy to welcome the following new Associates who have enrolled since September 1960:

Mr. M. Worth Acker  
 Mr. Herman A. Affel  
 Dr. and Mrs. Harold R. Almond  
 Dr. William S. Armour  
 Mr. G. A. Arrington  
 Miss Dorothy G. Baldwin  
 Mrs. Mark E. Balis  
 Dr. Robert P. Barden  
 Dr. George D. Beck  
 Mr. B. Griffith Calder  
 Mrs. George Carleton, Jr.  
 Mr. Edward C. Clauson  
 Dr. Joseph K. Corson  
 Dr. and Mrs. Edward T. Crossan  
 Mrs. Philip Dechert  
 Mrs. George S. Fox  
 Mrs. Edward B. Isett  
 Dr. H. P. Kirber  
 Dr. and Mrs. W. C. Klingensmith

Mr. Merle M. Krider  
 Dr. Herman C. March  
 Dr. Edward H. McGehee  
 Mrs. Reed A. Morgan, Jr.  
 Mr. Horatio H. Morris  
 Mrs. Arthur E. Newbold, III  
 Outdoor Gardeners of Montgomery Co.  
 Mrs. Raymond T. Parrot  
 Mr. George E. Patton  
 Mrs. Corning Pearson  
 Mr. Eli Kirk Price, III  
 Mrs. Olga Raska  
 Miss Claire Rosenthal  
 Dr. G. S. Schaberle  
 Mr. and Mrs. Bayard T. Storey  
 Dr. and Mrs. John C. Swartley  
 Mrs. John H. Thacher  
 Mrs. Edmond Thomas  
 Mr. and Mrs. Rodman E. Thompson, Jr.

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